REMARKS/ARGUMENTS

In view of the remarks herein, favorable reconsideration and allowance of this application are respectfully requested. Claims 1-10 are pending for further examination.

Claims 1, 6, and 7 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bilodeau et al. (U.S. Patent No. 6,384,822) in view of Higashiyama (U.S. Patent Publication No. 2002/0036638). Claims 2-5 and 8-10 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bilodeau in view of Higashiyama, and further in view of Matsumoto (U.S. Patent No. 5,043,922). These rejections are respectfully traversed.

Independent claim 1 requires, *inter alia*, "writing a Z value corresponding to each pixel within a predetermined area including at least the shadow casting object, into a Z-buffer, *using a light source placed in the virtual space as a viewpoint*" (emphasis added). Independent claims 6 and 7 incorporate similar features to this feature of claim 1. However, none of Bilodeau, Higashiyami, or the alleged combination thereof, disclose this feature of claim 1, or the similar features of claim 6 and 7.

The Office Action admits on page 3 that Bilodeau fails to teach or suggest "using a light source placed in the virtual space as a viewpoint," and introduces Higashiyama to make up for this deficiency with respect to Bilodeau. The Examiner alleges that reference V in Figure 4 is both the light source and the viewpoint.

A careful reading of Higashiyama, however, reveals that reference V in Figure 4 is not being used as both the light source and the viewpoint. As demonstrated below, reference V is indicative of only a light source, and not a viewpoint.

First, at paragraph 40, Higashiyama indicates that "light propagates in [the] direction of a light source vector V." Thus, reference V is indicative of the light source. If reference V were also the viewpoint, then polygons M01 would not be front-facing polygons. Because polygons M01 are front-facing (see paragraph 41) and because front-facing polygons are those that face in the direction of a viewpoint of a virtual camera (see abstract, paragraph 53, claims, etc.), the viewpoint must be somewhere other than at reference V. Indeed, the positioning of front-facing polygons M01 and back-facing polygons M02 suggests that the viewpoint is actually where the person reading the published application is located (e.g., "in front of" the paper on which the application is printed or "in front of" the screen on which it is displayed). By contrast, although it is difficult to tell exactly where the vector associated with reference V is pointing, if reference V were also the viewpoint, either the side of the triangle where reference M is pointing or the surface of the cylinder located "farthest" from the reader would be a front-facing polygon.

As such, Higashiyama fails to teach or suggest "writing a Z value corresponding to each pixel within a predetermined area including at least the shadow casting object, into a Z-buffer, *using a light source placed in the virtual space as a viewpoint*" (emphasis added), as required by claim 1. Thus, even if the combination of Bilodeau and Higashiyama were proper, the alleged combination still would not disclose each and every feature of independent claims 1, 6, and 7.

With respect to the rejection of claims 2-5 and 8-10, Applicant notes that the Office Action, at several places, refers to both Matsumoto and Matsuyama, the latter of which is not present on any of the Notices of References Cited or on any Information Disclosure Statements filed by Applicant. It is believed that the rejections are based on the introduction of Matsumoto alone, but the Examiner is kindly requested to confirm this view.

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Turning now to the rejection of claims 8-10, page 6 of the Office Action indicates that "Matsuyama discloses the ability to generate shadow volumes for models that have missing faces or 'holes' . . . and thus has the ability to reduce exception case handling." Assuming that the Office Action is referring to Matsumoto, Applicant respectfully submits that this statement is technically inaccurate.

First, just because a particular technique may be capable of generating shadow volumes for models that have missing faces or holes does not mean that it does so with a reduced amount of exception case handling. Indeed, some disadvantageous prior art techniques can generate shadow volumes for models that have missing faces or holes -- such references are disadvantageous not because they cannot generate such shadow volumes, but because they require exception case handling to do so.

Second, Matsumoto clearly requires exception case handling, which the specification of the instant invention identifies as disadvantageous and which is to be reduced per claims 8-10. Indeed, Matsumoto suggests that writing the shadow casting object into the Z-buffer to determine which edges of an object volume may be used for creating shadow polygons and to identify where exception cases arise. For example, Matsumoto discloses determining whether there is a shadow based on the parity of the number of intersections between the line of sight and the shadow polygons (col. 6, lines 19-24), and whether exceptions arise that complicate that determination (col. 10, lines 8-61). In other words, an object is written in the Z-buffer by using the light source as a viewpoint (hidden-surface removal) just to determine to which part of which edge of an object light is cast. Accordingly, in Matsumoto, a depth value stored in the Z-buffer after writing the object in the Z-buffer by using the light source as a viewpoint (hidden-surface

removal) has no significance. When as a result of writing the object in the Z-buffer by using the light source as a viewpoint (hidden-surface removal), edges which should be treated in a special manner are found, exceptional processing for creating a shadow polygon corresponding to the edges is required.
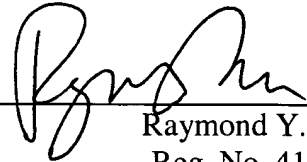
In marked contrast to Matsumoto, the invention of claims 8-10 involves determining a position of each vertex of a plurality of polygons composing the plane object to define the shadow volume through the use of a Z-buffer. This technique advantageously reduces the number of exception cases that may arise. The advantages of using the Z-buffer in this way are particularly evident when compared to the techniques of Matsumoto which, as noted above, uses its Z-buffer to detect where exception cases arise so as to be able to handle them appropriately. Thus, the alleged three-way combination of Bilodeau, Higashiyama, and Matsumoto fails to render obvious claims 8-10.

In view of the foregoing remarks, withdrawal of the rejections and allowance of this application are earnestly solicited. Should the Examiner have any questions regarding this application, or deem that any formalities need to be addressed prior to allowance, the Examiner is invited to call the undersigned attorney at the phone number below.

Respectfully submitted,

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